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Army Medical College Epidemiological
Research Report

Section 2 Number 135

Antibodies in Blood Eight Months After Inoculation with Supersonic Wave-Treated Cholera Vaccine

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General

The effectiveness of the cholera vaccine in reducing the infection rate and mortality rate of the disease already has been demonstrated by FERRAN and later by KOLLE, ZLATOGOROFF, STULILER, ZAHALATUGS and LEINNIWAUN. In our country this fact has been established through results of investigations performed in HYOGO Prefecture by MURATA and in OSAKA by NOMURA during cholera epidemics.

The actual effectiveness of cholera-vaccine inoculations, however, has been evaluated in several different ways. KANP and KERSTEN have claimed the effective period to be from three to four months, whereas KREDIEF, ROMER and HOFFMANN have claimed six months. The immunity titer disappears in seven to nine months, according to BALIKIN, and in one year, according to PAPAWAIKU and KONRADI. HETSCH has warned against exceeding the effective period and has recommended that inoculations be repeated every six months; the Germans and Austrians encountered success with this method during the World War.

Methods of manufacturing cholera vaccine are numerous, but in recent days the effectiveness of the supersonic wave-treated cholera vaccine has suddenly come into prominence. It has been reported already that in the immunization of humans the production of antibodies in the blood two weeks following the second inoculation proved superior to the controls. Since the continued effects of immune substances over an extended period among humans immunized with the supersonic wave-treated cholera vaccine remain unknown, tests to cover this phase have been ordered.

Chapter I. Test materials and procedure.

A. Test materials: The test sera consisted of sera taken on 9 Dec 39 from 34 out of 40 persons belonging to the Army Medical College Epidemiological Laboratory who, on 31 Mar 39 were inoculated with supersonic wave-treated cholera vaccines (hereafter referred to as U.S.V.) and from 33 out of 40 persons inoculated with control cholera vaccines (hereafter referred to as K.V.) prepared by the college.

Details on the above inoculation materials already have been described. (Ishii Force Bulletin II-80.)

Also included in the tests were sera taken on the same day from 152 persons (hereafter referred to as A.M.) not directly concerned with this experiment. The findings were not uniform as some of these persons had received cholera vaccine inoculations before March 1939 while others had no previous inoculations. Their sera were tested, however, to ascertain the general nature of antibodies in the blood.

The examinees were confined to those who from March 1939 to the day their blood was taken had not been inoculated with cholera vaccine. The sera were obtained after 5 cc of blood taken under sterile conditions from the median vein of each patient (empty stomach) was slant-coagulated in a sterile test tube. This was allowed to stand for 24 hours in a refrigerator (4°C) after which the serum underwent natural separation (some portions were removed by centrifugalization). Carbolic acid (0.5 per cent) was added and the sera were stored in a refrigerator.

B. Test procedure.

1. Agglutination reaction (Widal's reaction): The dilution of the test sera with a sterile physiological saline solution was successively doubled, starting with a 5-time dilution for the first test tube and ending with a 2,560-time dilution. The bacterial solution consisted of the Kitani strain cultured for 20 hours at 37°C in an agar medium and suspended at a ratio of 0.3 mg per cc in a physiological saline solution.

Following this, 1.0 cc of the bacterial suspension was added to 1.0 cc of the respective serum-dilutions mentioned above. This was shaken and incubated for two hours at 37°C. The results were observed on the following morning after it had been standing overnight at room temperature.

2. Complement fixation reaction: a. Preliminary test.

(1) Hemolytic series: A goat hemolytic series was used. Four units of hemolysin-serum possessing a hemolytic titer of 6,400 times were employed. (See Table 1.)

Table 1. Hemolysin value measurement test

Test tube number and hemolysin dilution	I 200	II 400	III 800	IV 1,600	V 3,200	VI 6,400	VII 12,800	VIII 25,600	Control I	Control II	Control III
Hemolysin-serum	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			0.5
Complement diluted 10 times	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	
0.5 % sensitized blood cell solution	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Physiological saline solution	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.5	1.5
				37°C 2 hours							
Results	L	L	L	L	L	L	H	H	H	H	H

(2) Complement: Sera taken from more than 10 marmots were mixed (separated in refrigerator) and allowed to stand for more than three hours at room temperature. The complement titer was measured before each experiment. Dilution was approximately 10 times. (See Table 2.)

Table 2. Complement value measurement test

Complement	8 X			10 X			12 X			14 X		
	0.15	0.20	0.25	0.15	0.20	0.25	0.15	0.20	0.25	0.15	0.20	0.25
Physiological saline solution	1.35	1.30	1.25	1.35	1.30	1.25	1.35	1.30	1.25	1.35	1.30	1.25
	37°C 1 hour											
5% sensitized blood cell solution	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	37°C 2 hours											
Results	K	L	L	K	k	L	H	K	FcL	H	K	K

(3) Antigen: The supersonic wave-treated antigen was obtained by culturing cholera bacteria (Kitani strain) in an agar medium for 18 hours at 37°C, suspending the bacteria in a physiological saline solution at a ratio of 10 mg per cc, subjecting 50 cc of the suspension to the action of 560 kc supersonic waves for 20 minutes in order to destroy the cells, and adding 0.5 per cent of carbolic acid. Complete hemolysis was displayed with a dilution of 8 times or more when the "self-retarding action" of this antigen was measured. The practical titer was set at 16 times. (See Tables 3 and 4.)

Table 3. Test on fixation strength of antigen and immune serum

Test tube number and antigen dilution	I 2	II 4	III 8	IV 16	V 32	VI 64	VII 128	VIII 256	Control I	Control II	Control III
Antigen	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
Complement diluted 10 times	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5
Immune serum diluted 10 times	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			0.5
Physiological saline solution									1.5	1.0	0.5
			37°C 1-hour incubation								
5% sensitized blood cell solution	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			37°C 2-hour incubation								
Results	H	H	H	H	K	K	kk	L	H	L	L

Table 4. Measurement test on practical antigen values

Test tube number and antigen dilution	I 8	II 4	III 8	IV 16	V 32	VI 64	Control VII	 VIII
Antigen	0.5	0.5	0.5	0.5	0.5	0.5		
Complement diluted 10 times	0.5	0.5	0.5	0.5	0.5	0.5		0.5
Physiological saline solution	0.5	0.5	0.5	0.5	0.5	0.5	1.5	1.0
			37° C 1-hour incubation					
5% sensitised blood cell solution	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
			37° C 1-hour incubation					
Results	H	H	L	L	L	L	H	L

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(4) Test sera: The test sera were rendered inactive by immersion in a 56°C water bath for 30 minutes.

(a) Main test: The dilution of the test sera with a physiological saline solution was successively doubled, starting with a 2.5-time dilution for the first test tube and ending with a 2,500-time dilution. Test serum volume was 0.5 cc of each dilution to which was added 0.5 cc of the complement and 0.5 cc of the antigen (starting with the second test tube). After incubating for one hour at 37°C 1.0 cc of a 5 per cent sensitized blood cell solution was added to each of the test tubes which were placed in the incubator for a two-hour period. These were allowed to stand at room temperature. The results were evaluated on the following morning. (See Table 5.) The fixation strengths are indicated by symbols H (formerly +++), K (formerly ++), k (formerly +), and L (formerly −). (Symbol F c l has been added in this test.)

3. Test-tube bacteriolysis (Neisser-Wechsberg method).

The test sera were inactivated at a temperature of 56°C lasting for 30 minutes. The complement was obtained from more than 10 marmots. This was mixed and diluted 10 times before using. The bacterial suspension consisted of cholera bacteria (Kitani strain) cultured in an agar medium (PH 7.8) for 18 hours at 37°C and suspended in bouillon (PH 7.8). This was diluted to a point where the bacterial content equalled .000001 mg per cc and immediately used.

The dilution of the test sera with a physiological saline solution was successively doubled, starting with a dilution of 5 times and ending with a dilution of 2,560 times. Each test tube contained 1.0 cc of diluted sera to which 0.5 cc of the above bacterial suspension and 0.5 cc of the complement were added. The mixture was incubated for two hours (shaken during this period) at 37°C and later placed in a sterile Petri dish. Agar (approximately 50°C) was added in amounts of 15 cc each. Bacterial colonies were counted after culturing for 20 hours at 37°C. The bacteriolytic titer of the sera was taken as the highest serum dilution at which 10 or less cholera bacterium colonies were produced. Controls were also observed.

4. Immunization tests.

The cholera bacteria were of the Kitani strain which were cultured in an agar medium (PH 7.8) for 18 hours at 37°C and which displayed a minimum lethal dose of 0.3 mg against white German mice. Mice weighing from 10 to 13 g each were employed in the tests.

Intraperitoneal injections were performed on these mice after 0.1 cc of fresh test sera and 0.4 cc of the cholera

bacterium suspension (0.3 mg of bacteria in 0.4 cc of physiological saline solution) were mixed in the hypodermic syringe. Observations were continued over a three-day period. Over 0.6 mg of cholera bacteria was required during the preliminary tests in producing total death.

Table 5. Main test procedure on complement fixation reaction.

Test tube number and serum dilution	I 2.5	II 5	III 10	IV 20	V 40	VI 80	Control VII	VIII	IX
Serum volume (inactive)	0.5	0.5	0.5	0.5	0.5	0.5			
Antigen diluted 16 times	-	0.5	0.5	0.5	0.5	0.5	-	-	0.5
Complement diluted 10 times	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-
Physiological saline solution							1.5	1.0	1.0
	37°C 1-hour incubation								
5% sensitized blood cell solution	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	37°C 2-hour incubation								
Results							H	L	L

Chapter II. Test results and summaries.

A. Agglutination reaction results and summary

(See Tables 6 and 7 below.)

Table 6. Agglutination reaction results

Serum dilution			0	5	10	20	40	80	160	320	-	Total serum / total examines
Vaccine type	O.I.V.	Number positive	0	0	4	7	16	6	1	0	0	25 / 34
		%	0	0	11.76	20.59	47.05	17.65	2.94	0	0	
	I.V.	Number positive	1	4	11	10	4	2	1	0	0	24 / 33
		%	3.03	12.12	33.33	30.30	12.12	6.06	3.03	0	0	
	A.E.	Number positive	18	43	49	23	15	3	1	0	0	157 / 152
		%	11.84	28.29	32.24	15.30	9.87	1.97	0.65	0	0	

Table 7. Agglutination reaction results.

Cases positive to the agglutination reaction at dilutions of 40 times and over totalled 57 per cent for the U.S.V., 32 per cent for the K.V. and 12 per cent for the A.M. At dilutions of 10 times and over the positive cases totalled 100 per cent for the U.S.V., 84 per cent for the K.V. and 60 per cent for the A.M. U.S.V. cases showing a negative agglutination reaction or positivity to the 5-time dilution were not encountered.

One case each was produced at the maximum agglutination value of 160-time dilution. The majority of the U.S.V. cases were positive to dilutions of 320 times and over, but in examining the drop in individual agglutination values after eight months had elapsed the values were found to be between 40 and 80 times. The values for K.V. were still lower, indicating a drop to 10 to 20 times.

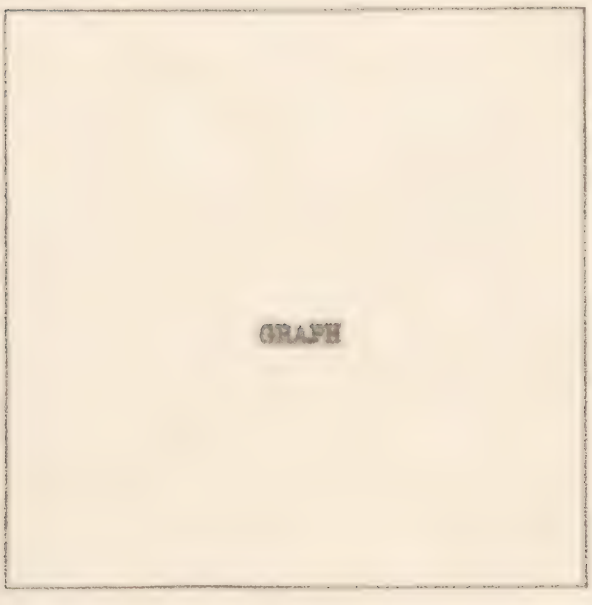
The U.S.V. indicated the highest average individual score, according to the agglutination reaction results, with a figure of 3.8, followed by K.V. with 1.7 and by A.M. with 1.0. By score is meant the exponential score represented by the exponent of prime factor 2 for the absolute value of the antigen-antibody reaction titer possessed by the individual serum.

B. Complement fixation reaction results and summary:
Complement fixation strength was generally weak. In every instance the complement fixation titer was maximum at a 20-time dilution. Five cases (14.71 per cent) were indicated by U.S.V., one case (3.03 per cent) by K.V. and five cases (3.22 per cent) by A.N. (See Tables 8 and 9.)

Table 8. Complement fixation reaction results

Serum dilution			0	5	10	20	40	-	Total sera / Total positives
Vaccine type	D.I.V.	Number positive	12	8	9	5	0	0	12/34
		%	35.50	23.53	26.47	14.71	0	0	
	E.V.	Number positive	13	14	5	1	0	0	7/33
		%	39.39	42.42	15.15	3.48	0	0	
	A.M.	Number positive	74	45	29	5	0	0	36/152
		%	48.02	29.93	19.08	3.23	0	0	

Table 9. Complement fixation reaction results.



Definite results showing a decrease in individual complement fixation strengths were not observed. The average individual score was 0.56 point for U.S.V., 0.21 point for K.V. and 0.25 point for A.K., the latter two being less than one half of U.S.V.

C. Test-tube bacteriolysis results and summary: (See Tables 10 and 11.)

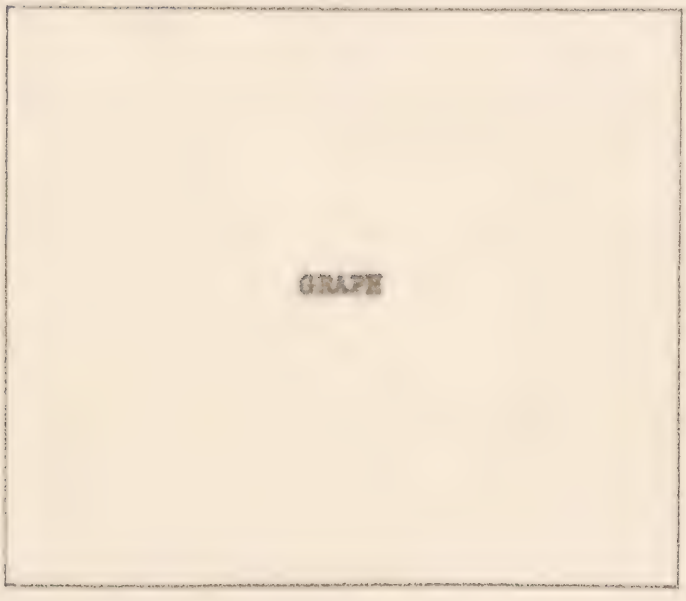
Table 10. Bacteriolysis reaction results

Serum dilution			5	9	10	20	40	80	160	320	640	1280	2560 or slightly less	Total score / Total cases
Serum type	S.S.V.	Positive cases	2	1	2	1	2	2	6	5	5	4	4	147/34
		Positivity %	5.88	2.94	5.88	2.94	5.88	5.88	17.65	14.71	14.71	11.77	11.77	
	K.V.	Positive cases	2	5	2	2	6	4	6	0	4	2	0	114/33
		Positivity %	6.06	15.16	6.06	6.06	18.18	12.12	18.18	0	12.12	6.06	0	
	A.M.	Positive Cases	22	16	9	5	17	20	11	10	19	16	7	502/152
		Positivity %	14.47	10.53	5.92	3.29	11.18	13.16	7.24	6.58	12.50	10.53	4.61	

Table 11. Bacteriolysis test results

3½"

3"



More than half (53 per cent) of the U.S.V. cases indicated a bacteriolytic titer of 320 times and over. Approximately half (48 per cent) of the K.V. cases indicated a titer of 80 times and over, not differing to any great extent from that displayed by A.N.

Fluctuations in individual bacteriolytic titer after eight months were observed, but because of the insufficient amount of sera and the small number of examined cases in the initial series a standard for comparison could not be established. It was observed, however, that eight months after inoculation the U.S.V. retained a distinctly higher amount of hemolysin as compared to the control.

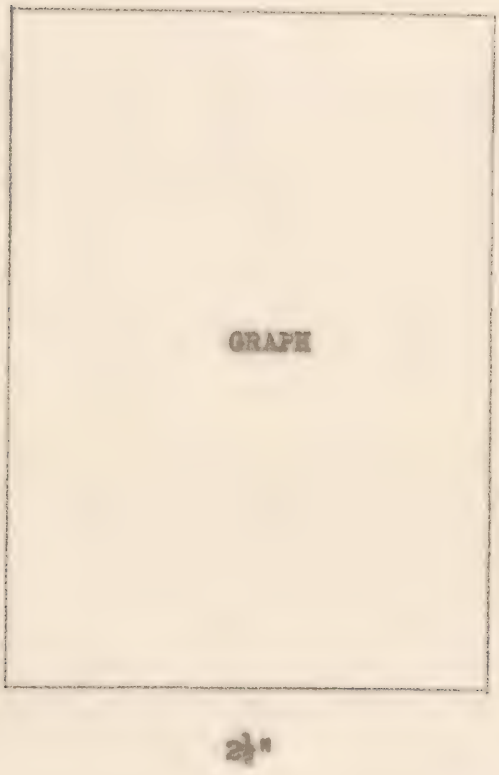
The highest average individual score was displayed by U.S.V. with 5.3 points, followed by K.V. with 3.5 points and A.N. with 3.9 points.

B. Immunization test results and summary: The immunization tests were performed on laboratory animals corresponding in number to the 32 persons, 29 persons and 141 persons from whom the U.S.V., K.V. and A.N. test sera, respectively, were derived.
(See Tables 12 and 13.)

Table 12. Immunization test results

Days observed			1	2	3	Total
Serum types	U.S.V. (from 34 cases)	Deaths	8	6	1	15
		Death rate (%)	25	18.75	3.13	46.85
	K.V. (from 33 cases)	Deaths	14	5	1	20
		Death rate (%)	42.27	17.24	3.45	68.97
	A.M. (from 152 cases)	Deaths	83	21	18	122
		Death rate (%)	58.87	14.90	12.77	86.52

Table 13. Immunization test results



The death rate of animals employed in the tests and inoculated with K.V. and A.M. practically reached or exceeded one half their number on the first day, whereas the rate for U.S.V. was only 35 per cent. The total covering the three-day period reveals a 47-per cent rate for U.S.V., a 69-per cent rate for K.V. and an 87-per cent rate for A.M.

Deaths among the infected animals were the highest on the first day, but decreased on the second and third days, in that order.

These results show the U.S.V. serum to possess the highest immunization strength followed by the K.V. serum; the A.M. serum displayed extremely weak immunization strength.

Chapter III. Conclusion

A. Comparative studies were made on the antibodies contained in human blood eight months after inoculations of supersonic wave-treated cholera vaccines and control cholera vaccines (manufactured by Army Medical College) were made on the same day. In addition the antibodies contained in the blood of persons not connected directly with the above experiment were studied.

B. The sera from persons who had been inoculated with supersonic wave-treated vaccines were found to retain the original agglutinin, complement fixation substances, bacteriolysin and immune substances eight months after the inoculation. The amount retained greatly surpassed that retained in persons who had been inoculated with the control cholera vaccine (manufactured by Army Medical School).

C. The antibodies contained in the blood of persons who had been inoculated eight months previously with the control cholera vaccine (manufactured by Army Medical School) gave the impression of being slightly superior in number to those of ordinary persons. The results, however, indicated no great difference between the two.

Supplement

An opportunity to examine the blood types of a large number of persons was provided. The results of this examination have been added to the main text as a supplement.

The standard serum prepared by the Army Medical College Epidemiological Section was dissolved in a physiological saline solution according to an established rule. Blood cells of the highest possible freshness were allowed to act upon this. Blood cell agglutination was examined and the results were determined within a three-minute period. (See Tables 14, 15 and 16 and Supplementary Table 1.)

Supplementary Table 1. Blood type

3"

GRAPH

3"

Key

(1) Blood type

A comparative study of the individual antibody productivity performed concurrently with inoculations (based on blood types) of supersonic wave-treated cholera vaccine and control cholera vaccine revealed no particularly marked differences. (See supplementary Table 2 for comparative results.)

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Blood type		U.S.V.						K.V.					
		Serum number	Agglutination reaction	Complement fixation reaction	Bacteriolysis	Immunity		Serum number	Agglutination reaction	Complement fixation reaction	Bacteriolysis	Immunity	
			8 mos. previous / Present	8 mos. previous / Present	8 mos. previous / Present	Present			8 mos. previous / Present	8 mos. previous / Present	8 mos. previous / Present	Present	
O	Results	28	320 - 40	10 - 20	- -	(+)		36	640 - 0	40 - 5	1280 40	(-)	
		44	40 - 40	5 - 20	- 128	(+)		57	640 - 10	20 - 10	1280 10	X	
		165	640 - 40	160 - 20	0 640	(+)		75	640 - 20	20 - 0	- 5	(-)	
		167	640 - 10	20 - 0	- 80	(-)		96	160 - 5	5 - 0	- 45	(-)	
		178	320 - 20	40 - 5	- 640	(+)		106	320 - 20	10 - 0	- 20	(-)	
		179	- - 20	- - 5	- 0	(-)		139	- - 40	- - 5	- 5	X	
		182	640 - 40	40 - 5	640 320	(+)		148	80 - 20	5 - 5	- 80	(+)	
		191	640 - 40	40 - 0	0 160	(+)		149	- - 10	- - 20	- 5	(-)	
		6	- - 40	- - 5	- 2560	(-)		144	640 - 10	20 - 5	640 160	(-)	
		22	- - 40	- - 10	- 1280	(+)		73	640 - 10	40 - 10	640 40	(-)	
		65	- - 10	- - 5	- 0	(-)		55	- - 80	- - 0	40	(+)	
		80	- - 80	- - 0	- 160	(+)							
		126	- - 40	- - 5	- 140	(+)							
		180	640 - 10	- - 10	0 2560	(+)							
		134	- - 40	- - 10	- 320	(+)							
	Individual average	Titer score points	485 - 34 6.25 - 2.53	49 - 6 2.63 - 0.47	160 678 175 543	11/13		Titer score points	470 - 20 6.25 - 1.55	20 - 5 1.63 - 0.36	1024 40 7.60 2.18	2/9	
A	Results	16	640 - 40	20 - 0	- 160	(+)		27	320 - 20	10 - 5	- 640	(-)	
		18	640 - 20	20 - 5	- 2560	(-)		74	164 - 40	10 - 5	- 160	(+)	
		98	320 - 20	20 - 0	- 320	(-)		124	640 - 5	20 - 5	640 1280	(+)	
		99	320 - 0	40 - 5	- 10	X		133	160 - 20	5 - 0	- 1280	(+)	
		127	320 - 80	10 - 20	- 320	(+)		147	160 - 20	5 - 5	- 5	(-)	
		132	320 - 40	20 - 0	- 160	(+)		157	320 - 5	20 - 5	- 0	(-)	
		155	320 - 40	20 - 20	- 640	(+)		175	80 - 20	0 - 0	- 160	(-)	
		4	- - 20	- - 10	- 40	(-)		188	160 - 10	5 - 0	- 80	(-)	
		78	- - 20	- - 10	- 320	(+)		35	- - 10	- - 0	- 5	(-)	
		125	- - 20	- - 10	- 640	(-)							
		131	- - 80	- - 10	- 320	(-)							
		72	- - 80	- - 0	- 160	(+)							
	Individual average	Titer score points	411 - 40 6.29 - 2.75	21 - 7 2.00 - 0.66	0 479 0 5.5	5/11		Titer score points	250 - 17 5.37 - 1.44	9 - 4 7.50 - 0.11	640 401 7 4.11	3/9	
B	Results	47	160 - 160	10 - 10	- 1280	(+)		21	640 - 20	20 - 10	1280 160	(+)	
		128	640 - 10	80 - 0	0 5	(-)		33	320 - 10	10 - 0	- 40	(-)	
		150	160 - 80	10 - 10	- 640	(-)		58	80 - 5	5 - 10	- 80	(-)	
		151	320 - 40	2 - 0	- 10	(-)		94	640 - 40	40 - 0	640 40	(-)	
		154	640 - 10					168	160 - 10	8 - 0	- 0	(-)	
		301	640 - 40	80 - 0	0 80	X		176	640 - 10	40 - 5	320 80	X	
								15	- - 5	- - 0	- 640	(+)	
								56	- - 5	- - 0	- 20	(+)	
								71	- - 160	- - 0	- 10	(+)	
								88	- - 20	- - 0	- 160	(-)	
	Individual average	Titer score points	4.62 - 62 6.17 - 3.17	37 - 3 2.33 - 0.33	213 342 2.33 4.60	1/5		Titer score points	4.00 - 28 6.00 - 1.63	19 - 4 1.43 - 0.27	747 126 7 3.54	3/10	
AB	Results		320 - 80	10 - 20	- 2560	(-)		136	320 - 40	10 - 5	- 640	X	
								153	640 - 10	20 - 0	0 640	(+)	
	Individual average	Titer score points	320 - 80 6 - 4	10 - 20 1 - 2	- 2560 - 91	0/1		Titer score points	480 - 25 6.5 - 2	15 - 2.5 1.5 - 0	0 640 0 7	1/1	

Table 14. Results on persons inoculated with U.S.V.

Reaction	Agglutination reaction											Complement fixation reaction											Bacteriolysis											Immunity			Blood type
Serum dilution	Agglutination titer (X) (8 mos. previous)	5	10	20	40	80	160	320	640	1280	2560	Complement fixation titer (X) (8 mos. previous)	5	10	20	40	80	160	320	640	1280	2560	Bacteriolytic titer (X) (8 mos. previous)	5	10	20	40	80	160	320	640	1280	2560	1st day	2nd day	3rd day	
Serum number 16	640	+	+	+	±	—	—	—	—	—	—	20	L	L	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	1	193	197	320	420	—	—	—	A
18	640	++	++	+	—	—	—	—	—	—	—	20	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	1	2	—	+	—	A
28	320	++	+	+	+	—	—	—	—	—	—	10	K	k	FCL	L	L	L	L	L	L	L	"	0	1	9	313	176	—	—	—	—	—	—	—	—	A
44	40	+++	++	+	+	—	—	—	—	—	—	5	K	k	FCL	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	1	7	40	—	—	—	B
47	160	++	++	+	+	+	+	—	—	—	—	10	k	FCL	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	0	10	—	—	—	AB
64	320	+++	++	++	+	±	—	—	—	—	—	10	K	k	FCL	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	2	6	—	+		A
98	320	++	+	+	—	—	—	—	—	—	—	20	L	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	1	11	19	27	+			A
99	320	+	+	+	—	—	—	—	—	—	—	40	L	L	L	L	L	L	L	L	L	L	"	0	0	23	29	61	34	116	40	188	138				A
127	320	++	++	+	+	+	—	—	—	—	—	10	k	K	FCL	L	L	L	L	L	L	L	"	0	0	0	0	0	1	8	20	150	312	—	—	—	A
128	640	+	±	—	—	—	—	—	—	—	—	80	L	L	L	L	L	L	L	L	L	L	0	0	15	53	156	220	220	280	216	240	320	+			B
132	320	+++	++	+	—	—	—	—	—	—	—	20	L	L	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	1	19	30	7	155	—	—	—	A
150	160	+++	++	+	+	±	—	—	—	—	—	10	k	FCL	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	13	19	—	+		B
151	320	++	++	+	+	—	—	—	—	—	—	20	L	L	L	L	L	L	L	L	L	L	"	3	9	10	15	17	60	54	99	100	138	+			B
154	640	++	++	+	+	—	—	—	—	—	—	20	L	L	L	L	L	L	L	L	L	L	640	0	0	0	9	24	40	132	126	96	92	—	+		B
155	320	++	++	++	++	—	—	—	—	—	—	20	K	k	FCL	L	L	L	L	L	L	L	No experiment	0	0	0	0	1	1	5	6	10	30	—	+		A
165	640	+++	++	++	+	—	—	—	—	—	—	160	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	4	6	6	21	32	—	—		O
167	640	++	+	—	—	—	—	—	—	—	—	20	L	L	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	41	184	400	160	—	+				O
178	320	++	+	+	—	—	—	—	—	—	—	40	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	11	13	+	—	—	O
180	640	++	++	—	—	—	—	—	—	—	—	80	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	1	2	—	—	—	O
182	640	+	+	+	+	—	—	—	—	—	—	40	k	L	L	L	L	L	L	L	L	L	640	0	0	0	0	0	1	3	204	204	200	—	—	—	O
191	640	++	++	+	+	—	—	—	—	—	—	40	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	3	10	56	120	128	—	+		O
301	640	+++	++	+	+	—	—	—	—	—	—	80	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	14	37	35	38	48				B
4	No experiment	++	+	+	—	—	—	—	—	—	—	No experiment	k	FCL	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	22	104	119	175	172	157	+			A
6	"	++	+	+	±	—	—	—	—	—	—	"	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	4	5	—	—	—	O
22	"	+++	++	++	++	—	—	—	—	—	—	"	k	FCL	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	2	10	—	—	—	O
65	"	+	+	—	—	—	—	—	—	—	—	"	k	L	L	L	L	L	L	L	L	L	"	60	80	120	115	160	120	96	—	—	—	+			O
72	"	+	+	+	+	+	—	—	—	—	—	"	L	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	21	13	41	88	—	—	—	A
78	"	++	++	+	—	—	—	—	—	—	—	"	k	FCL	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	38	51	32	—	—	—	A
80	"	++	++	++	++	++	—	—	—	—	—	"	L	L	L	L	L	L	L	L	L	L	"	0	0	3	1	2	3	250	360	460	490	—	—	—	O
125	"	++	+	+	—	—	—	—	—	—	—	"	k	FCL	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	18	63	+			A
126	"	+++	++	++	+	—	—	—	—	—	—	"	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	1	10	68	25	132	—	—	—	O
131	"	+++	++	++	++	—	—	—	—	—	—	"	k	FCL	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	94	99	—	—	—	+	A
134	"	+++	++	+	+	—	—	—	—	—	—	"	k	FCL	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	1	14	47	50	—	—	—	O
179	"	+	+	+	—	—	—	—	—	—	—	"	k	L	L	L	L	L	L	L	L	L	"	41	4	30	0	45	40	49	53	61	134	+			O
Total		34 0	34 0	30 4	22 12	7 27	1 33	0 34	0 34	0 34	0 34		22 12	14 20	5 29	0 34	0 34	0 34	0 34	0 34	0 34	0 34		32 2	31 3	29 5	28 6	26 8	24 10	18 16	12 22	8 26	4 30	8 24	6 13	1 7	O - 15 A - 12
Percentage of positivity and negativity	Positive	100	100	88.24	64.71	20.59	2.95	0	0	0	0		64.71	41.18	14.71	0	0	0	0	0	0	0		94.11	91.17	85.29	82.35	76.46	70.58	52.94	35.29	23.52	11.76	25.00	18.75	3.13	B - 6
	Negative	0	0	11.79	35.29	79.41	97.59	100	100	100	100		35.29	58.82	85.29	100	100	100	100	100	100	100		5.08	8.82	14.70	17.64	23.52	29.41	47.05	64.75	76.47	88.12	75.00	56.25	53.13	A - 1

Note: Persons inoculated with U.S.V. but who were absent from the first test have been listed in this table starting with Serum Number 4.

Table 15. Test results on persons inoculated with K.V.

Reaction	Agglutination reaction											Complement fixation reaction											Bacteriolysis											Immunity			Blood type
Serum dilution	Agglutination titer (X) (8 mos. previous)	5	10	20	40	80	160	320	640	1280	2560	Complement fixation titer (X) (8 mos.previous)	5	10	20	40	80	160	320	640	1280	2560	Bacteriolytic titer (X) (8 mos.previous)	5	10	20	40	80	160	320	640	1280	2560	1st day	2nd day	3rd day	
Serum number 21	640	++	++	+	—	—	—	—	—	—	—	20	k	FCL	L	L	L	L	L	L	L	L	1280	0	0	0	0	0	0	42	48	79	180	—	—	—	B
27	320	++	+	—	—	—	—	—	—	—	—	10	k	L	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	0	0	0	25	304	+			A
33	320	+	+	—	—	—	—	—	—	—	—	10	L	L	L	L	L	L	L	L	L	L	"	0	0	0	0	16	25	204	400	428	344	+			B
36	640	—	—	—	—	—	—	—	—	—	—	40	k	L	L	L	L	L	L	L	L	L	1280	0	0	0	0	19	29	66	126	200	315	+			O
57	640	+	+	—	—	—	—	—	—	—	—	20	k	FCL	L	L	L	L	L	L	L	L	1280	0	0	49	92	292	280	395	400	480	320	+			O
58	80	+	—	—	—	—	—	—	—	—	—	5	k	FCL	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	88	215	232	226	192				B
74	160	+	+	+	+	—	—	—	—	—	—	10	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	148	126	142	139	—	—	—	A
75	640	++	+	+	—	—	—	—	—	—	—	20	L	L	L	L	L	L	L	L	L	L	1280	0	36	400	400	∞	∞	∞	∞	∞	∞	—	—	—	O
94	640	++	++	+	+	—	—	—	—	—	—	40	L	L	L	L	L	L	L	L	L	L	640	0	0	0	0	22	60	0	120	240	304	+			B
96	160	+	—	—	—	—	—	—	—	—	—	5	L	L	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	22	26	20	50	30	60	+	—	+	O
106	320	+	+	+	—	—	—	—	—	—	—	10	L	L	L	L	L	L	L	L	L	L	"	0	0	0	36	55	32	120	190	130	180	+			O
124	640	+	—	—	—	—	—	—	—	—	—	20	FCL	L	L	L	L	L	L	L	L	L	640	0	0	0	0	0	0	0	0	0	20	+			A
133	160	++	++	+	—	—	—	—	—	—	—	5	L	L	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	0	0	0	0	62	—	—	—	AB
136	320	+	+	+	+	—	—	—	—	—	—	10	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	32	26				B
146	320	+	+	+	—	—	—	—	—	—	—	10	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	33	50	54	33	—	—		A
147	160	+	+	±	—	—	—	—	—	—	—	5	k	L	L	L	L	L	L	L	L	L	"	0	32	24	27	48	121	129	51	138	131	—	+		O
148	80	++	++	+	—	—	—	—	—	—	—	5	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	8	16	47	79	76	73	—	—	—	O
149	(-)	+	±	—	—	—	—	—	—	—	—	(-)	R	k	FCL	L	L	L	L	L	L	L	"	0	72	66	50	55	60	90	96	125	200	+			AB
153	640	+	+	—	—	—	—	—	—	—	—	20	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	153	175	—	—	—	AB
157	320	+	+	—	—	—	—	—	—	—	—	20	k	L	L	L	L	L	L	L	L	L	No experiment	31	8	14	10	68	69	46	41	68	61	+			A
164	640	+	+	—	—	—	—	—	—	—	—	20	k	L	L	L	L	L	L	L	L	L	640	0	0	0	0	0	0	164	115	164	192	+			O
168	160	+	+	—	—	—	—	—	—	—	—	5	L	L	L	L	L	L	L	L	L	L	No experiment	30	29	30	40	56	58	48	55	95	133	+			B
173	640	+	+	—	—	—	—	—	—	—	—	40	k	FCL	L	L	L	L	L	L	L	L	640	0	0	0	0	0	104	144	142	168	120	96	+			O
175	80	+	+	+	—	—	—	—	—	—	—	(-)	L	L	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	0	0	29	16	33	70	—	+		A
176	640	+	+	—	—	—	—	—	—	—	—	40	k	L	L	L	L	L	L	L	L	L	320	0	0	0	0	0	0	27	38	46	62	78				B
188	160	+	+	—	—	—	—	—	—	—	—	5	k	FCL	L	L	L	L	L	L	L	L	No experiment	0	0	0	0	0	8	15	128	160	204	280	—	+		A
15	No experiment	+	+	—	—	—	—	—	—	—	—	No experiment	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	0	0	0	0	15	144	+			B
35	"	+	±	—	—	—	—	—	—	—	—	"	L	L	L	L	L	L	L	L	L	L	"	0	36	28	23	37	23	36	36	39	54	+			O
55	"	++	++	++	+	+	—	—	—	—	—	"	L	L	L	L	L	L	L	L	L	L	"	0	0	0	0	10	16	36	87	90	155	—	—	—	B
56	"	+	—	—	—	—	—	—	—	—	—	"	L	L	L	L	L	L	L	L	L	L	"	0	0	0	13	24	28	18	21	32	26	—	—	—	B
71	"	++	++	++	+	+	—	—	—	—	—	"	L	L	L	L	L	L	L	L	L	L	"	0	0	37	82	560	340	190	139	129	238	+			B
46	"	++	+	+	—	—	—	—	—	—	—	"	k	L	L	L	L	L	L	L	L	L	"	0	0	0	0	0	5	12	62	38	∞	—	+		B
139	"	++	+	+	±	—	—	—	—	—	—	"	k	L	L	L	L	L	L	L	L	L	"	0	21	24	0	33	43	15	42	96	78				O
Total	(+)	32	27	16	6	2	1	0	0	0	0		27	7	1	0	0	0	0	0	0	0		31	27	24	22	16	12	7	6	2	0	14	5	1	O - 11 A - 9 B - 11 AB - 2
	(—)	1	6	17	27	31	32	33	33	33	33		13	26	32	33	33	33	33	33	33	33		2	6	9	10	17	21	26	27	31	33	15	10	9	
Percentage of positivity and negativity	Positive	96.97	81.81	48.48	18.18	6.06	3.03	0	0	0	0		60.60	21.21	3.03	0	0	0	0	0	0	0		93.93	81.81	72.72	66.66	48.48	36.46	21.21	18.18	6.06	6.06	48.27	33.33	1	O - 33.33% A - 37.38% B - 33.33% AB - 6.7 %
	Negative	3.03	18.18	51.51	81.81	93.94	96.97	100	100	100	100		39.39	78.79	96.97	100	100	100	100	100	100	100		6.06	18.18	27.27	30.30	51.51	63.63	78.78	81.81	93.93	100	51.72	66.66	9	

Table 16-1. Test results with A.M.

Reaction	Agglutination reaction										Complement fixation reaction										Bacteriolysis										Immunity			Blood type
Serum dilution (X)	5	10	20	40	80	160	320	640	1280	2560	5	10	20	40	80	160	320	640	1280	2560	5	10	20	40	80	160	320	640	1280	2560	1st day	2nd day	3rd day	
Serum number 2	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	4	23	54	55	160	200				B
3	++	+	+	±	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	50	70	230	+			O
5	++	++	+	+	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	2	0	4	26	6	16	+			O
7	+	+	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	3	40	20	42	106	31	199	−	−	−	AB
8	+	−	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	−	−	+	O
10	++	+	+	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	49	108	50	40	0	7	100	100	79	148	−	+		O
12	+	±	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	9	0	13	0	0	0	30	160	180	480	−	+		O
14	++	+	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	1	5	25	26	96	48	41	46	200	−	−	+	B
19	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	18	20	20	26	28	32	31	26	+			A
20	+	+	+	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	2	10	−	−	−	AB
23	+	−	−	−	−	−	−	−	−	−	k	FCE	L	L	L	L	L	L	L	L	0	0	0	1	6	10	41	60	70	121	+			O
24	++	++	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	16	−	−	−	A
25	+	+	−	−	−	−	−	−	−	−	K	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	1	9	27				A
26	++	+	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	2	0	0	0	0	45	70	106				B
29	++	+	+	+	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	1	0	2	5	26	76	105	166	180	−	+		A
30	++	++	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	2	34	21	38	192	∞	∞	∞				O
32	++	+	+	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	8	32	200	+			A
38	++	+	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	2	10	140	+			A
39	++	+	+	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	24	+			AB
40	+	+	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	9	56	−	−	−	A
41	+	+	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	1	0	8	18	23	93	170	+			A
42	++	+	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	7	0	0	0	3	34	29	76	81	−	+		A
43	++	+	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	55	∞	∞	∞	∞	∞	−	+		O
46	++	+	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	5	8	12	8	10	11	35	+			B
48	−	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	48	32	53	48	67	119	119	141	300				A
49	+	+	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	36	26	28	20	30	46	82	+			A
50	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	115	164	232	184	285	284	207	288	253	−	+		O
51	−	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	4	4	23	42	284	200	+			A
52	+	+	+	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	1	1	2	5	6	−	−	−	O
54	+	+	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	1	0	11	66	32	168	120	96	200				O
59	+	+	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	15	38	160	+			O
61	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	2	2	1	5	6	8	−	+		O
62	+	+	+	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	59	90	98	66	56	20	194	490	248			+	B
63	+	+	+	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	10	12	16	20	30	+			A
66	+	+	±	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	2	1	36	−	−	−	O
68	+	+	+	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	9	14	52	94	57	126	150	−	+		B
73	+	+	−	−	−	−	−	−	−	−	K	FCL	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	43	+			O
76	−	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	19	20	30	14	24	45	102	128	132	+			A
79	+	+	+	±	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	10	36	−	−	−	AB
81	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	32	150	+			A
83	+	+	+	+	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	4	5	76	+			O
84	+	+	+	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	70	105	100	97	77	203	+			B
85	+	−	−	−	−	−	−	−	−	−	k.	L	L	L	L	L	L	L	L	L	0	∞	∞	∞	∞	∞	∞	∞	∞	∞	−	−	−	O
86	+	+	+	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	29	124	250	260	136	−	−	−	A
87	−	−	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	106	118	146	120	160	96	66	83	48	150	+			O
89	+	+	+	+	+	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	1	0	0	0	0	1	2	1	0	0	+			A
90	++	+	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	0	1	0	0	0	1	+			O
91	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	1	30	3	44	+			O
92	±	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	8	38	200	−	−	+	O
95	+	±	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	1	1	1	1	1	29	38	71	60	−	−	−	O
100	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	16	27	+			A
101	+	+	±	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	16	98	−	+		B
102	+	+	+	±	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	3	+			O
103	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	16	0	0	0	42	20	29	78	76	+			O
104	+	+	+	+	+	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	3	1	5	11	−	+		A
105	−	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	1	0	0	4	55	147	∞	∞	∞	∞	+			A

Table 16-2. Test results with A.M. (Cont'd)

Reaction	Agglutination reaction										Complement fixation reaction										Bacteriolysis										Immunity			Blood type
Serum dilution (x)	5	10	20	40	80	160	320	640	1280	2560	5	10	20	40	80	160	320	640	1280	2560	5	10	20	40	80	160	320	640	1280	2560	1st day	2nd day	3rd day	
Serum number 107	+	−	−	−	−	−	−	−	−	−	L	FCL	L	L	L	L	L	L	L	L	0	1	1	7	17	28	60	37	65	73	+			A
108	−	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	8	8	92	86	++			B
109	−	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	30	47	45	86	90	170	300	380	++			O
110	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	3	184	200	156	124	102	128	++			O
111	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	448	350	368	336	480	400	360	256	∞	∞	−	+		A
113	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	150	155	201	+			O
114	+	−	−	−	−	−	−	−	−	−	K	k	FCL	L	L	L	L	L	L	L	0	0	0	0	26	30	96	200	250	350	−	−	+	O
115	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	1	0	4	31	248	∞	∞	∞	∞	+	−		O
116	+	−	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	7	92	400	460	548	560	−	+		A
118	+	−	−	−	+	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	0	68	73	55	59	70	+		+	AB
119	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	1	64	102	328	∞	∞				A
120	+	−	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	0	0	4	44	143	271				A
121	+	−	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	0	0	0	55	200	480	∞	∞				O
122	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	40	131	46	17	40	50	86	100	101	+			B
129	+	−	−	−	−	−	−	−	−	−	K	k	FCL	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	2	5				O
130	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	∞	∞	∞	∞	∞	∞	∞	∞	∞				O
135	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	1	26	18	16	13	43	54	41	39	−	−	+	A
137	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	25	28				A
138	+	−	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	1	0	0	9	18	78	45	126	150	−	−	−	B
141	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	10	118	272				B
143	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	133	70	117	300	−	−	++	B
144	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	37	32	67	165	280				A
156	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	0	0	2	45	184	400	420	460				B
158	+	−	−	−	−	−	−	−	−	−	K	k	FCL	L	L	L	L	L	L	L	240	300	500	560	980	520	480	640	∞	∞				A
159	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0		+		A
160	+	−	−	−	−	−	−	−	−	−	k	L	L	L	L	L	L	L	L	L	0	0	5	9	7	12	18	16	47	81	106				O
161	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	14	20	80	62	115				A
162	+	−	−	−	−	−	−	−	−	−	K	k	FCL	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	3	1				A
163	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	3	6	42	68	160	200	−	−	+	B
166	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	4	5	20	18	−	−	++	B
169	+	−	−	−	−	−	−	−	−	−	k	K	FCL	L	L	L	L	L	L	L	0	0	0	0	0	0	22	21	176	126	268	+	+		A
170	+	−	−	−	−	−	−	−	−	−	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0	0	0	2	8	97	103	−	−	−	O
172	+	−	−	−	−	−	−	−	−	−	k	FCL	L	L	L	L	L	L	L	L	0	0	5	2	9	22	72	103	34	145	−	+		O
174	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	10	37	+	−		A
177	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	60	125	−	+		A
181	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	65	71	+	−		O
183	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	320	65	−	+		A
187	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	240	+	−		A
186	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	190	65	−	+		O
190	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	39	194	++	−		A
192	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	188	56	−	+		A
193	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	36	23	−	−		A
201	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	24	82	+	−		O
202	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	65	100	−	+		A
203	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	65	∞	+	−		O
204	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	41	∞	−	+		A
205	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	+	−		O
208	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	−	+		O
210	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	+	−		O
212	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	−	+		O
213	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	+	−		O
216	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	−	+		O
217	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	+	−		O
218	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	−	+		O
219	+	−	−	−	−	−	−	−	−	−	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	+	−		O
220	+	−	−	−	−	−	−	−	−	−	k	k	FCL	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	−	+		O

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Table 16-3. Test results with A.E. (Cont'd)

Reaction	Agglutination reaction										Complement fixation reaction										Bacteriolysis										Immunity			Blood type
Serum dilution (x)	5	10	20	40	80	160	320	640	1280	2560	5	10	20	40	80	160	320	640	1280	2560	5	10	20	40	80	160	320	640	1280	2560	1st day	2nd day	3rd day	
Serum number 221	++	++	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	12	+	—	—	A
223	++	++	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	10	23	0	17	25	46	—	—	—	O
225	—	—	—	—	—	—	—	—	—	—	k	PCL	L	L	L	L	L	L	L	L	0	0	20	23	128	200	124	146	152	112	—	—	—	O
227	++	++	+	—	—	—	—	—	—	—	k	k	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	80	—	—	—	B
228	++	++	—	—	—	—	—	—	—	—	k	PCL	L	L	L	L	L	L	L	L	0	0	0	0	0	0	29	10	51	87	—	—	+	B
230	+	+	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	3	108	—	—	+	A
231	+	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	120	268	230	68	22	134	254	∞	—	—	—	O
232	+	—	—	—	—	—	—	—	—	—	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	16	9	42	96	248	—	+	—	A
233	+	+	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	60	87	46	77	100	100	∞	∞	—	—	—	O
234	++	++	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	24	30	10	22	8	7	4	3	38	55	—	—	—	B
235	+	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	450	—	—	—	O
236	—	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	46	—	—	—	O
237	+	—	—	—	—	—	—	—	—	—	k	L	L	L	L	L	L	L	L	L	23	0	74	30	76	93	86	81	114	200	—	—	—	A
238	+	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	80	—	—	—	O
239	++	++	+	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	5	24	—	—	—	O
240	++	++	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	7	4	21	41	61	44	41	40	+	+	—	AB
241	++	+	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	160	—	—	—	A
242	++	—	—	—	—	—	—	—	—	—	k	PCL	L	L	L	L	L	L	L	L	0	0	0	0	0	0	28	45	120	100	—	—	—	O
243	+	+	—	—	—	—	—	—	—	—	k	k	L	L	L	L	L	L	L	L	73	100	78	44	60	80	56	69	100	100	—	—	—	A
244	++	+	—	—	—	—	—	—	—	—	k	k	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	6	35	—	—	—	O
246	—	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	45	33	14	3	3	0	23	43	50	—	—	—	A
247	+	+	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	50	75	88	31	98	150	160	23	89	58	+	—	—	AB
248	+	+	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	0	—	—	—	O
249	++	+	—	—	—	—	—	—	—	—	k	L	L	L	L	L	L	L	L	L	50	78	149	132	149	140	230	80	270	∞	—	—	—	B
252	—	—	—	—	—	—	—	—	—	—	k	L	L	L	L	L	L	L	L	L	0	90	160	288	270	164	253	264	271	300	—	—	—	A
253	++	—	—	—	—	—	—	—	—	—	k	L	L	L	L	L	L	L	L	L	0	44	45	130	26	80	85	++	++	++	—	—	—	O
255	++	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	1	0	10	400	++	++	++	++	++	—	—	—	B
256	++	+	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	4	3	79	296	++	9	45	62	98	200	—	—	—	O
257	+	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	++	++	++	++	++	++	++	++	++	++	—	—	—	AB
259	—	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	1	0	0	0	0	0	0	0	16	—	—	—	O
260	++	+	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	0	120	—	—	—	O
261	++	+	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	5	23	—	—	—	O
262	+	—	—	—	—	—	—	—	—	—	k	PCL	L	L	L	L	L	L	L	L	0	72	70	136	184	73	142	147	171	121	—	—	—	B
263	+	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	189	136	240	200	220	116	110	90	150	200	—	—	—	A
298	+	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	0	18	56	—	—	—	O
299	+	+	+	—	—	—	—	—	—	—	k	FCL	L	L	L	L	L	L	L	L	0	8	24	28	50	58	36	70	9	110	—	—	—	B
300	++	+	+	+	—	—	—	—	—	—	k	L	L	L	L	L	L	L	L	L	0	0	0	3	5	7	16	28	62	36	—	—	+	A
302	+	+	—	—	—	—	—	—	—	—	k	FCL	L	L	L	L	L	L	L	L	0	1	1	1	12	62	36	66	88	156	++			AB
303	+	—	—	—	—	—	—	—	—	—	L	L	L	L	L	L	L	L	L	L	0	0	0	0	0	12	6	8	1	2	++			O
304	++	++	+	+	—	—	—	—	—	—	k	L	L	L	L	L	L	L	L	L	0	0	0	0	0	0	0	3	13	15	—	+		AB
Total (+)	135	91	42	20	4	1					78	30	5								130	114	106	102	86	65	55	43	23	7	83	21	18	
(−)	17	61	110	132	148	151	152	152	152	152	74	122	147	152	152	152	152	152	152	152	22	38	46	50	66	87	97	109	129	145	58	37	19	O - 65 A - 53 B - 23 AB - 11
Positivity (%)	88.82	59.87	27.76	13.16	2.63	0.66					51.97	19.74	3.29								85.52	75.00	69.73	67.10	56.57	42.76	36.18	28.28	15.13	4.60	58.87	14.89	12.77	
Negativity (%)	11.18	40.13	72.37	86.84	97.37	99.34	100.0	100.0	100.0	100.0	48.02	80.26	96.71	100.0	100.0	100.0	100.0	100.0	100.0	100.0	14.47	25.00	30.26	32.89	43.42	57.23	63.81	71.71	84.86	95.39	41.13	26.24	13.48	